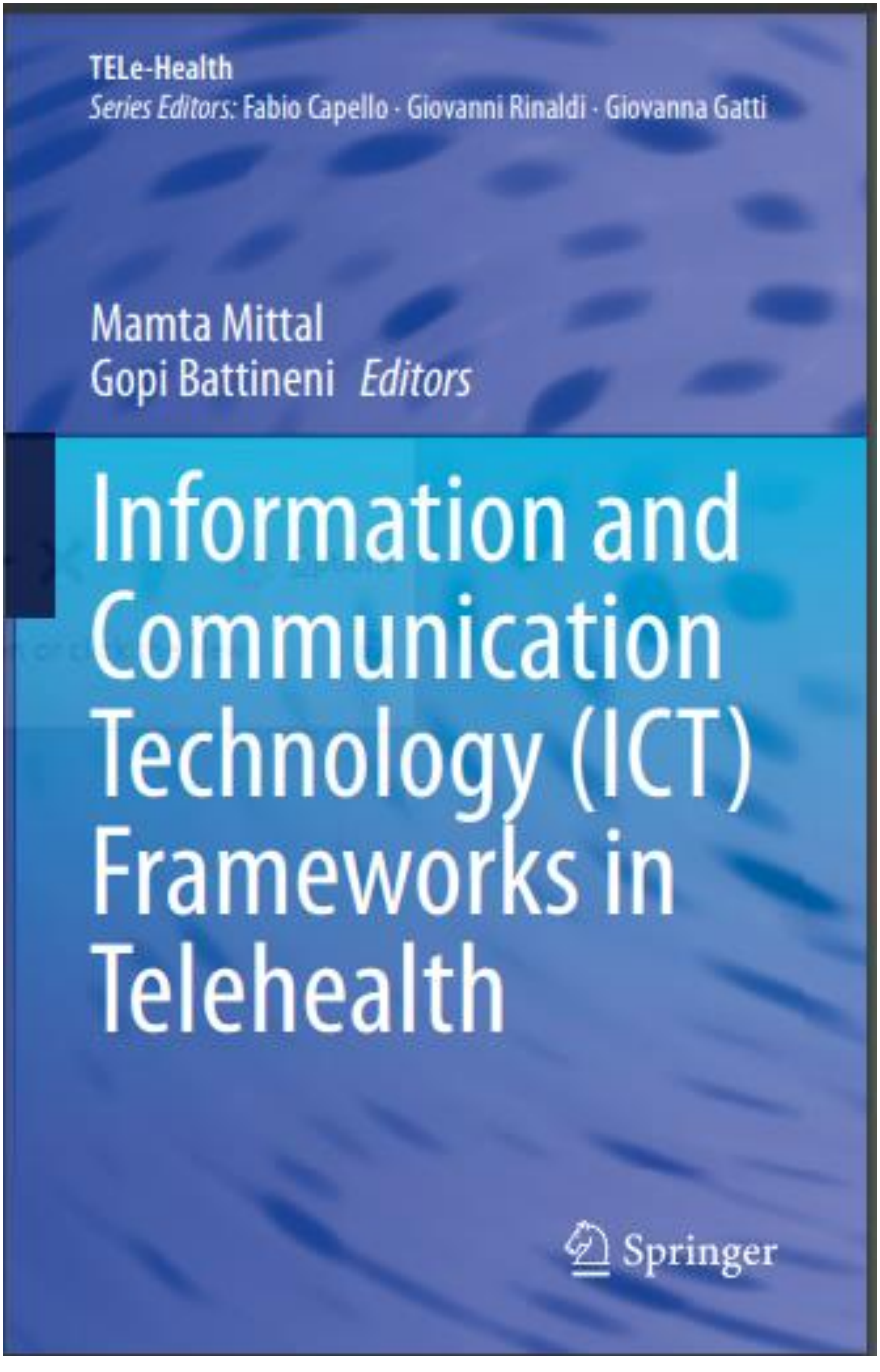

TELe-Health

Series Editors: Fabio Capello · Giovanni Rinaldi · Giovanna Gatti

Mamta Mittal
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Information and Communication Technology (ICT) Frameworks in Telehealth

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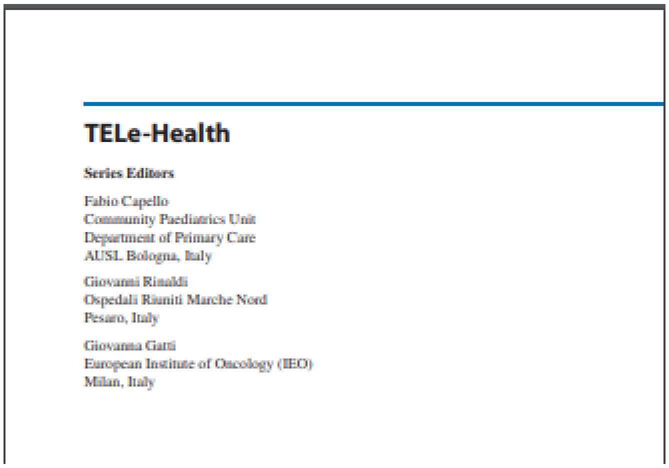
145-158



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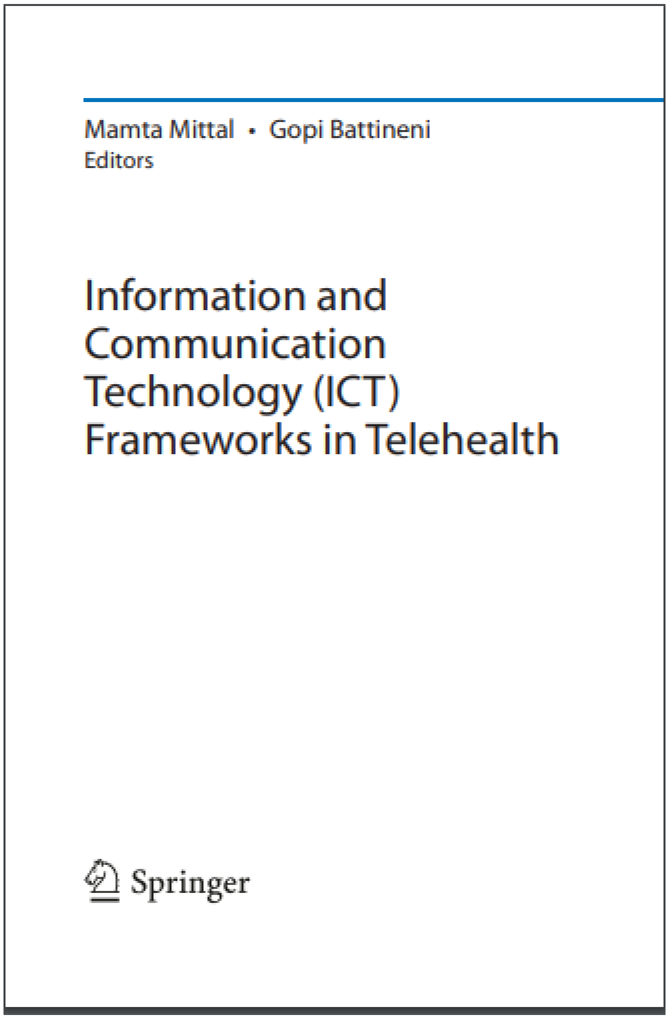

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TELEMEDICINE FRAMEWORK TO MITIGATE THE IMPACT OF THE COVID-19 PANDEMIC

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Abstract

COVID-19 pandemic has badly burdened the medical facilities and paramedics. There are ever-rising apprehensions about COVID-19 management and its control, as its management required expensive diagnosis, control treatment, continuous monitoring, and regular follow-ups during the pandemic. COVID-19 pandemics has radically changed the medical practitioners' approach towards the treatment of the patient. Owing to COVID-19, there is a rapid change in how Medical facilities are administered as technological advances are being accepted and adopted in medical broadly especially facilities like telemedicine and virtual care are gaining wider acceptance. Telemedicine and virtual care refer to providing healthcare services using digital platforms and making use of advanced Information and Communications Technology (ICT) for the treatment of patients. Telemedicine helps in safeguarding the paramedics and patients from exposure to COVID-19 pandemics by reducing exposure and helps in extending timely care as it is cheap, available to every person and reduces hassle of commuting. Further steps are being taken to further enhance the facilities by adopting new communication technologies for the communication of telemedicine and treatment.

Keywords: COVID-19, telemedicine, technology, digital device, and patients

Introduction

In December 2019, a 2019-coronavirus (COVID-19) pandemic was observed in Wuhan, China, triggering a major public health catastrophe that quickly grew into a worldwide pandemic (Khan et al., 2020). Shandong province is a highly populated and massive, economically developed province with a lot of population migration. As a result, in Shandong province, preventing an epidemic was critical. Pneumonia cases have been reported in Wuhan, although the cause has yet to be determined (Lewnard et al., 2020). World Health Organization formally recognized highly contagious Coronavirus Disease 2019 (Zu et al., 2019). There were 180000 confirmed cases and more than 7000 deaths caused by the virus worldwide through March 2020. Even if the virus is causing symptoms, the patients are still infected even after the symptoms have subsided after two weeks (Dashraath et al., 2020). After China, Italy was the first country to be attacked by the virus, which has wreaked havoc on the country (Spinelli et al., 2020).

Fever, dry cough, breathing difficulty, anosmia, and respiratory failure are some of the symptoms of coronavirus. The disease's therapy is uncertain, although an antiviral approach is being employed to promote immunomodulation in the virus's management (Ruiu and Ruiu, 2020). The first case was heard on January 30, 2020, and in March, the government enacted emergency restrictive measures to demobilize social contact (Ruiu and Ruiu, 2020). The reduced incidence and mortality rates might imply that the Shandong providence's preventative initiatives were successful. “Provincial government and Shandong Health Committee acted rapidly in the face of the outbreak, forming an Anti-Epidemic Expert Group to develop diagnostic, treatment, quarantine, and reporting methods” (Zu et al., 2019). Telemedicine also offers community residents and medical doctors preventative and treatment data, as well as training of remote consultation from doctors for sick workers before returning to work. Due to the public uncontained spread, healthcare professionals are already observing and are planning for both ill and worried-well patients, which might pressure hospital care units (Lewnard et al., 2020). Public health provider response processes and practices have been updated to include the use of telemedicine technology to address some of the particular challenges that infectious disease outbreaks such as COVID-19 and others offer. The Anti-Pandemic Expert Group discovered that the telemedicine platform helped suppress the “COVID-19 epidemic in Shandong province” as shown in Figure 1. The results of the trial are presented here, as well as the advantages of employing telemedicine to prevent COVID-19 (Dashraath et al., 2020).

Coronaviruses (CoVs) are multi species, single stranded RNA virus, which may infect humans, mammals, birds as well as livestock, providing a public-health, veterinary, and economic danger. Coronavirus infections mostly cause respiratory and gastrointestinal disorders in people and animals (Kampf, et al., 2020). Coronaviruses, like “HCoV-229E and HCoV-OC43”, are present in the community, and these together with the more recently discovered as “HCoV-NL63 and HCoV-HKU1”, can be responsible for typically mild respiratory infections. “SARS-CoV, MERS-CoV, and SARS-CoV-2” (Corman et al., 2018) are very dangerous viruses that have only recently emerged in people. humans, “SARS-CoV, MERS-CoV, and SARS-CoV-2” damage bronchial epithelial cells, leading to life-threatening in humans. The coronavirus spike (S) protein binds to cellular entrance receptors, “which have been found for various coronaviruses and include human aminopeptidase N (APN; HCoV-229E), angiotensin-converting enzyme 2 (ACE2; HCoV-NL63, SARS-CoV and SARS-CoV-2) and dipeptidyl peptidase 4 (DPP4; MERS-CoV)”, results are pathogenicity by a virus (Tortorici and Veesler, 2019).

RNA genomes of coronavirus are very immense, “including 5′ and 3′ untranslated regions that include cis-acting secondary RNA structures required for RNA production. At the 5′ end, the genomic RNA features two large open reading frames (ORFs; ORF1a and ORF1b) that occupy two-thirds of the capped and polyadenylated genome. ORF1a and ORF1b code for 15–16 non-structural proteins (nsp)”, help in transcription complex, which includes: RNA processing and modification, among other things. Now COVID-19 has all claimed lives throughout the world. During the COVID-19 pandemic, doctors rely on modern technology for prevention, early symptom triage, self-isolation, quarantine, and, eventually, resumption of social engagement as compared to the past (Letko et al., 2020).

Emphasis on COVID-19 Evidence

Following the enormous expansion of the “SARS-CoV-2 virus”, WHO has professed a pandemic by coronavirus 2019 sickness (COVID-19) on March 11, 2020 (Khan et al., 2020 and 2021). The COVID-19 outbreak has executed a worldwide curfew, wreaking havoc on everyday life and most health-care systems, which has had to deal with both infected and healthy individuals. It is effects on the farmers life and the agrarian elements inhibit the COVID-19 in human (Khan et al. 2021). During this important era, the usage of telemedicine has expanded, owing to both favorable evidence from earlier pandemics and technology developments, particularly in developed countries (Chauhan, 2020). A flood of new digital technologies has been added to traditional phone interviews. International guidelines should be updated to reflect the emergence of e-health technology, with clear differences made between advice for everyday use and emergency recommendations. Due to the lack of vaccinations or efficient treatments, as well as the use of social boundaries and lockdown as primary preventative measures, telemedicine is the safer means for patients and physicians to connect. The huge scale of this epidemic has also aided in closing the gap in terms of poor adherence to the usage of digital technologies (Li et al., 2020). Through the COVID-19 contagion, social distance sparked three possible e-health uses, according to existing findings and models (Kumar, 2020). On the other side, patients who are at higher risk of contagion: chronic, immunosuppressive, autoimmune, or can lower their risk of infection by electronically interacting with their practitioner/specialist. As a result, only the most end of conditions warrants a referral to a therapeutic center. Furthermore, enhanced telephone triage methods have been created, allowing for better screening of suspicious "SARS-CoV-2" patients who are referred to emergency care because they are concerned about "SARS-CoV-2" infection.

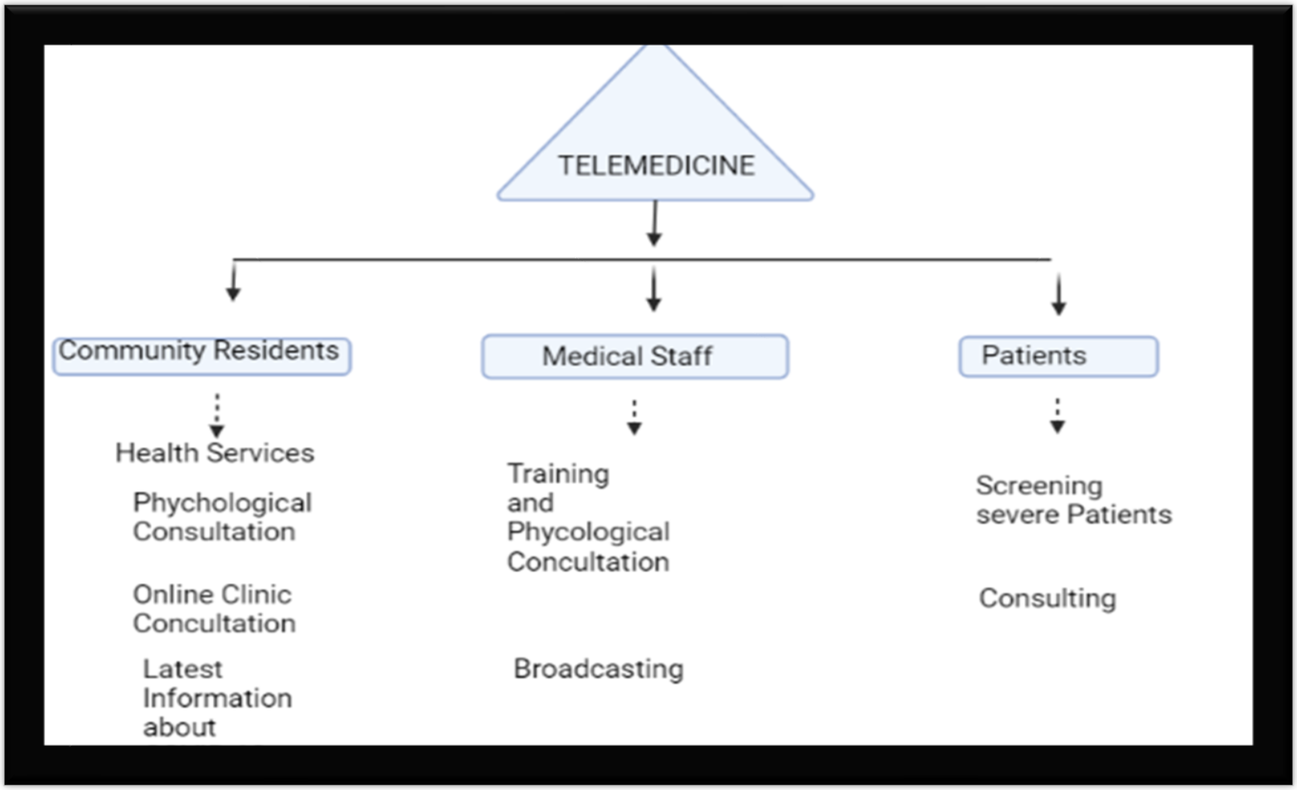
TELEMEDICINE
Community Residents
Medical Staff
Patients
Health Services
Phychological Consultation
Online Clinic Concultation
Latest Information about
Training and Phycological Concultation
Broadcasting
Screening severe Patients
Consulting

Figure 1. Functions of the telemedicine in the world

Patient, whether “asymptomatic or minimally symptomatic”, don’t get priority for hospitalization; Nonetheless, COVID-19 health centers, doctors, and local health officials keep a careful eye on them. through specific channels. Furthermore, e-health communication has allowed minimally infected professionals to continue their usual practice by allowing them to do so remotely. The practicality of this novel medical method is still a point of contention (Hollander and Carr 2020, Khan et al., 2022). On behalf of better global telemedicine acceptance in the future, the cost-benefit ratio of these instruments should be enhanced, with a larger focus on chronic illness treatment., beyond the current emergency context.

Telemedicine in COVID-19

New coronavirus (COVID-19) pandemic has disturbed total health systems of most the countries, over 92 million infected patients and around 2 million deaths. Furthermore, many systems are unprepared due to lack of infrastructure for ensuring comprehensive health care. Because of the pandemic's heavy burden on health systems, trustworthy medical treatment is required. This may be gathered using extensive digital tools, which are particularly useful in treating and making decisions. The epidemic of COVID-19 has compelled all healthcare authorities to work together to encourage the use of digital technology (Doshi et al., 2020). Despite significant legal and ethical concerns, the majority of medical specialists believe that telemedicine may be a valuable health care source during epidemics. Telemedicine technology is used to monitor moderate or asymptomatic illnesses might help to lower the large number of patients that come in. Telemedicine has recently gained a lot of traction as a result of the growing deployment and development of digital technology. It should be considered for inclusion in national and international recommendations when they are updated (Battineni et al., 2021). Due to enforced social isolation, telemedicine has shown to be the safest engagement mode between patients and doctors during pandemic conditions. Some scenarios for telemedicine uses have been proposed on evidence-based. Because of the high risk of poor prognosis, its usage for diabetes and complication monitoring has exploded. Recent studies and technological breakthroughs in diabetic retinopathy (DR) screening via telemedicine have demonstrated efficacy and usability. Furthermore, even with an initial cost increase for devices and training, teleophthalmology has been shown to be cost-effective. In the COVID-19 pandemic, lack of data severely restricts the potential of tracking the disease's true treatment, which is only achievable based on previous information under normal circumstances. The epidemic highlighted the significance of remote monitoring even more. However, general practitioners must have easy access to the gadget and digital application used to boost individual screening and track the evolution of retinal disease. In cases of isolation, lockdown, or movement restriction, a digitized care approach should be used, especially in places where healthcare services are not readily available or for patients with limited mobility (Caetano et al., 2020).

Telemedicine is often characterized as a collection of technologies and equipment that may be used to get information about a patient's health state from a distance in order to determine whether or not an intervention is required. For this reason, it might serve as a screening and diagnostic tool, as evidenced by current research, to increase the acceptance and progress of digital technology like smartphones and digital networks. Suitable technologies enable doctors to reach and monitor persons who have difficulty attending specialist consultations, particularly patients with chronic conditions who require ongoing monitoring (Portnoy et al., 2020). Furthermore, if a face-to-face visit is not possible, therapy might be evaluated on a regular basis by transmitting data collected on the digital tool to an expert. Cardiovascular disorders and diabetes, with all of their chronic consequences, can be handled by telemedicine. Retinopathy, the most prevalent diabetic complication, frequently demands an eye-care professional's fundus oculus examination; however, individuals in countryside regions and those who live very far from specialist referral facilities and cannot comply with these screenings (Bahshur et al., 2020). Telemedicine platforms are well-suited to dealing with a variety of difficulties that healthcare systems encounter in the aftermath of global infectious disease outbreaks. Putting in place telemedicine solutions that cater to the demands of low-acuity patients who are concerned about disease exposure which help to reduce and minimize overcrowding in emergency rooms of hospitals, urgent care clinics, and general care centers and offering advices according to patient’s desire. Telemedicine can also be used to manage chronic illness patients' ongoing healthcare requirements, lowering the frequency of in-person clinic visits. Telemedicine applications decrease human exposure to a variety of infectious illnesses (among healthcare personnel and patients) and ensure that medicinal resources are allocated for patients who require them (Calton et al., 2020).

Importance of Telemedicine in Pandemic

In an emergency, telemedicine and telemonitoring systems can treat patients without requiring them to visit a hospital. Telemedicine systems use video conferencing to provide a direct connection with patients through smartphones or PC. The entire system should be managed by custom software to ensure stable connections, information flow, and data security. All governments must make numerous efforts to guarantee that diseases like the COVID-19 pandemic can be efficiently handled. In this context, telemedicine, if fully integrated into a national health system, might prove to be a useful technique in and of itself for maintaining treatment continuity and lowering infection risk, especially among health professionals. It would also result in less overcrowding in health-care institutions and just a modest loss of physicians and nurses (Smith et al., 2020). It's also been difficult to find places to deploy telemedicine during emergency situations. In 2015, in epidemic area, few possible evidence-based scenarios were proposed in which e-health can be used to all patients. When there is a suspicion of infection-related symptoms, this "home-based" treatment is extremely successful, allowing individuals to be referred to specialized referral centers. Positive asymptomatic individuals can also be followed up on a regular basis via phone and web counselling. Beyond that, digital delocalization techniques have contributed to the enhancement of these services in recent years. Telemedicine may be used to care for patients who are in domiciliary or nosocomial isolation and for this reason telemedicine, provides enough safety for both physicians and caregivers by restricting contact with diseased patients to strictly non-deferrable emergencies (Smith et al., 2020). Finally, telemedicine can currently help outpatients' management of periodic visits, which have been discontinued due to local governments' obligatory lockdown.

Telemedicine applications are another telemedicine strategy for identifying and mapping infected people as providing “self-assessment capabilities”. The 'Coronavirus SUS' app is an example from the Brazilian government. If this app-assisted analysis indicates a suspected disease, sick people are sent to the nearest emergency department for screening, increasing the efficiency of traditional therapy. Brazilian program also gives evidence-based information on the progression of a pandemic, which helps to reduce the dissemination of false information (Ministry of Healthcare, 2020). A telemedicine tool that combines “prevention, triage, and information” in one app has reduced stresses on Brazil's public healthcare system and, as a consequence, prevented the system's collapse; a similar program is being examined in the United States. Likewise, in the United Kingdom, “King's College London, in collaboration with Guy's and St Thomas' hospitals, has created an app that allows residents to self-report their health status in one minute every day”. Citizens are being invited to fill out a survey. They can then report on how they feel on a daily basis, including standard COVID-19 signs like coughing and fever, as well as nontraditional symptoms including weariness, confusion, diarrhea, no-taste, chest discomfort. If the app learns that sick individuals report in clusters across the country, new ailments will be added to the list. Data from the app would be used to estimate how the virus is spreading in different locations, 'hotspot' locations are situated, and understanding how symptoms are connected to basic health issues can help identity who is most at risk (Knag et al., 2020).

Cardiovascular disorders, in particular, demand constant monitoring, which raises infection risk for both patients and clinicians. Remote monitoring has grown beyond emergencies in this setting, with significant advancements in e-health technology observed during epidemics and pandemics. Electrophysiologists, for example, most clinical appointments are now being monitored remotely telephone/video calls for visits, evaluation of data from digital wearables, and (Ploux et al., 2017) post-procedural follow-up should be done remotely. In this regard, the SARS-CoV-2 coronavirus pandemic has provided a significant boost to the management of various chronic illnesses (Slotwiner et al., 2015). With the help of telemedicine, doctors may understand the country's current healthcare situation without sacrificing quality and allowing for more effective prevention without “face-to-face interaction”. The self-isolation phase, on the other hand, has the ability to isolate and overwhelm society's most vulnerable members. Individuals who have been socially isolated have stated concerns: anxiety, fear, and sadness, as well as post-traumatic stress disorder symptoms in certain circumstances. These negative psychological impacts, as well as the additional pressure on healthcare systems that they may cause, can be minimized by using digital platforms to promote social connections, such as video chats. As a result, such platforms open up further telemedicine possibilities, such as video-based psychotherapy sessions. In the COVID-19 pandemic, “the Australian government is providing mental health professional support via telemedicine”, which ensures the supply of basic services to people in need while considerably decreasing and in some cases completely eliminating face-to-face therapy in hospitals (Khairat et al., 2020).

In addition to fulfilling the needs of individuals with low acuity, telemedicine may provide specialty treatment to patients in locations where such care is unavailable, both domestically and globally. According to studies, COVID-19 death rates in Chinese communities with little contact with doctors have overtaken mortality rates in locations with more access. Telemedicine technologies, especially in low-resource locations, can greatly improve care synchronization for COVID-19 patients. Given that telehealth is designed to address a variety of issues arising from the COVID-19 epidemic, the CDC, as well as other state public health agencies and industry groups, have recommended that telemedical systems be included in healthcare provider coronavirus facilities (Dorsey and Topol, 2020).

Telemedicine has long been advocated as a way to increase healthcare access while cutting costs. Telemedicine has now become a vital tool to give clinical treatment as a result of the coronavirus disease 2019. Centers for Disease Control and Prevention advised ambulatory facilities to postpone elective visits early in the pandemic to prevent “SARS-CoV-2” spread among patients and doctors. Health care systems across the country did not cancel any urgent clinic appointments or procedures, resulting in a sudden and pressing need to switch to alternate health care delivery models. “Telemedicine, which includes office visits and other medical services delivered over the internet using interactive two-way telecommunications systems (i.e., real-time audio and video), has the potential to reduce patient exposure to the clinic environment, preserve the limited supply of personal protective equipment (PPE), and reduce the backlog of deferred patient care caused by the COVID-19 pandemic response”. A few foresighted hospital systems had previously implemented telemedicine services before the bill was approved (Kruse et al., 2017). Patients who are asymptomatic will benefit from telemedicine, which will allow them to keep their quarantine period while being monitored via smartphones, laptops, and other devices. If the patient's symptoms become serious, the patient will be transferred to medical treatment quickly. Patients' data is collected through SLOT (Social Internet of Things) and AI (Artificial Intelligence) approaches in telemedicine. Different digital instruments are used to monitor a patient's vitals, such as a digital sphygmomanometer (to check blood pressure), an oximeter (to check saturation), a pulse meter, and so on, and the patient may use all of these devices independently because they are so simple to use (Li et al., 2021).

Effect of Telemedicine on Health

Telemedicine as a technique for decreasing negative health effects and maximizing the usage of health resources. Rapid spread of diseases offerings a major threat to the entire globe. The use of social distance measures, like teleworking and training and education, is an effective strategy to minimize the widespread of the epidemic, specifically in the realm of public health, prevention, and clinical practices. Telemedicine is a method for lessening the negative health impacts and increasing the use of health benefits. The important strategy is to reduce and mitigate the spread of the epidemic disease and to use social distance measures; that is why telemedicine, like other sectors like teleworking and training and education, supports the health disciplinaries, particularly in the areas of public health and clinical practices. Telemedicine utilizes the Internet and associated technologies to provide easy, low-cost, and speedy access to health-related information and communication. Telemedicine began with the use of telephone consultations and has evolved with each technological advancement and now includes computer technologies to give information and services to clients in multiple locations, which is especially important in pandemics because it can help maintain the moderation phase. It may be utilized for the following purposes in the present situation: (Chauhan et al., 2020).

- Reducing the amount of time, it takes to get a diagnosis, start therapy, quarantine, or stabilize a patient.
- Allowing for close monitoring: residents may be observed from home, minimizing overcrowding in medical facilities, preventing individuals from moving (saving travel time), and lowering the danger of infection within the hospital.
- Organizing medical resources in far-flung areas.
- Preventing the spread of infection, particularly among professionals, who are critical assets to protect: avoiding physical contact, limiting the danger of respiratory secretion exposure?
- Educating citizens • Green effect of telemedicine: cost savings on “antiseptic” materials: disposable gloves and robes, disinfection of guest rooms, etc.
- Educating health-care professionals who are new to the treatment of coronavirus infections).
- Real-time data monitoring: European Centre for Disease Prevention and Control (ECDC), for example, offers constantly updated information on the pandemic's progress (Li et al., 2020).

The disease is more likely to develop in its most severe form in older persons, as well as those with medical conditions such as hypertension, heart disease, or diabetes (Zhou et al., 2020). "Travel restrictions have been implemented and enforced over the world, and most cities have been quarantined" to limit transmission. Those who have not been infected with COVID-19, especially those who are at a higher risk of developing the virus, should receive daily therapy without risk of exposure to other hospital patients. Non-essential workers are also strongly prevented to visit the COVID-19 patient's ward due to strict infection control (Candy, 2020). Natural catastrophes and epidemics create lots of new problems for healthcare providers. As a result, one-of-a-kind and innovative solutions are required to meet the urgent demands of COVID-19 patients and others in need of medical attention. Technological advancements have opened up new possibilities in this regard. Telemedicine has the potential to improve epidemiological research, disease control, and clinical case management during epidemics (Greenhalgh et al., 2020). Telehealth is a 21st-century method that protects patients, physicians, and others by focusing on the patient. Telehealth is defined as the provision of health care services over long distances by health care professionals who use information and communication technology (ICT) to exchange accurate and trustworthy data. Real-time or store-and-forward techniques are used to offer telehealth services. Patients and healthcare practitioners/doctors may now communicate thanks to the fast innovation and reduction of portable technologies such as smartphones and webcams (Mehrotra et al., 2016).

To decrease the danger of exposure to others and workers, Health care programs are also delivered to those who are sick or in quarantine through video conferencing. Quarantined doctors can use these services to care for their patients while they are confined. Using a tele-physician to cover a large number of locations can also help with some of the workforce's problems (Valle et al., 2017). Telehealth has various advantages, especially in routine care and treatments that do not require direct patient-provider interaction, such as mental therapy (Jahanshir et al., 2017). This technology is very useful and cost-effective. Patients want to use telemedicine, yet obstacles remain. Accreditation, payment systems, and insurance are all major barriers to these programs' implementation. Moreover, doctors are worried about technological quality (Campion et al., 2016).

Management of Diabetic Retinopathy during COVID-19

Many studies have been done across the world to assess the usefulness of telemedicine in various clinical contexts, with a particular focus on ophthalmology. Several studies, for example, have looked into the utility of telemedicine in the diagnosis of glaucoma, with largely similar results (Sauser-Ford et al., 2019). The largest research, which included over 24,000 patients and was done in the United Kingdom, found an 87 percent agreement between optometrist and ophthalmologist assessments (Cohen's)., Tele glaucoma showed a “sensitivity of 41.3 % and a specificity of 89.6%” in Kenya when compared to a standard fundus oculus (Gasmi et al., 2020). Comparable research on creative smartphone applications was conducted in Canada, despite the identical findings, photographs were ungradable in 24% of situations. Smartphone ophthalmoscopy disclosed substantial agreement with lamp testing. Despite the fact that the data on e-health technologies for age-related macular degeneration screening and for cataracts. Diabetes, coupled with its multiple complications, puts patients at significant risk of having a bad prognosis, as previously indicated. Telemedicine has shown to be a valuable strategy for managing glycemic levels on a regular basis over the years. Patients' restricted access to specialty visits is caused by a variety of factors like lack of time, distance from specialized clinics, disability issues, and wide waiting lists. In the case of pandemics, social isolation has an even bigger role (Mittal et al., 2020).

In particular, the introduction of “digital glycemia” monitoring devices like glycemic holders and micropump in both type 1 and type 2 diabetes patients has enabled for simpler “glycemia self-monitoring”. Data is immediately collected and delivered to a specialist or general practitioner, who may then consider future therapy changes as well as more in-depth diagnostic and therapeutic investigation. Different studies have shown that users of glycemic monitoring devices had a higher rate of HbA1c goal accomplishment than controls, resulting in a lower risk of complications (Rho et al., 2015). The emphasis of screening and monitoring activities has been diabetic retinopathy. Fundus cameras and other portable devices can be used by doctors and technicians to take retinal photos that can be sent to specialized referral centers for reading. The usefulness and usage of telemedicine in this condition have been proven by data from throughout the world. The use of non-mydriatic cameras has good sensitivity and specificity, and a comparison of telemedicine and a standard fundus oculus test indicated that the use of non-mydriatic cameras has a good sensitivity and specificity (Rho et al., 2015). A recent screening trial in “India using Fundus on Phone” (Remidio FOP), a piece of smartphone-based imaging equipment, resulted in the identification of

DR in over 3,500 individuals. Furthermore, six to eight months' follow-up, telemedicine was shown to dramatically increase the number of people who have checked for DR. The second research of roughly 100 diabetic patients found that fundus oculus photographs had a sensitivity of 97.1 percent and a specificity of 95 percent in diagnosing moderate non-proliferative DR (NPDR) compared to the usual test. The research was done with a comparable sample size found that "2-field 50-degree non-stereo digital fundus photos had higher sensitivity (85%) and specificity (90%) in the diagnosis of mild NPDR than slit-lamp ophthalmoscopy conducted by an ophthalmologist" (Natarajan et al., 2019). Almost 1,500 diabetes participants were evaluated for DR using a digital smart ophthalmoscope in the no blind trial, a multicenter cross-sectional investigation. In 15.5% of the study population, fundus oculus photographs taken by qualified doctors were diagnostic for diabetic retinopathy (Bilong et al., 2019).

Many smartphone applications for acquiring nonmydriatic photos of any part of the eye have been created in recent years. Recent studies have anticipated a 50-60% rise of screened patients, which is consistent with our estimations, due to a significant improvement in picture quality. Similarly, two screening initiatives in Africa and Canada attempted to recover the quality of life of people with various retinal illnesses, as well as reduce the incidence of complications (Natarajan et al., 2019).

Furthermore, teleophthalmology revealed a favorable cost-to-effectiveness ratio, both in terms of human and financial resources, as well as travel expenses for private and public health systems. It was newly established in a "meta-analysis" of cost effectiveness analyses of telemedicine-based ophthalmologic screening programs in many nations that, despite an initial rise in equipment and training expenses, there is an economic reduction over time. Similarly, employing retinal cameras instead of conventional tests resulted in considerable budgetary savings in our multicenter experience as well as time reductions for both patients and doctors (DeBuc, 2016).

Removal of telemedicine barriers

In COVID-19 crisis, politicians in different countries learned how critical it was to eliminate barriers to telemedicine care. Several CMS regulations and standards regulating telemedicine services are temporarily suspended during the COVID-19 emergency situation, according to the "Coronavirus Preparedness and Response Supplemental Appropriations Act", which was signed on March 6, 2020. The law notably waives the rural region requirement as well as the originating location restrictions, enabling patients to be treated anywhere, including reimbursing telemedicine services. The CMS announced on April 30, 2020 that compensation for telephone visits would be temporarily enhanced to match those for in-person and video consultations. Most states have provisionally suspended interstate licensing regulations during the current public health emergency, while others have made it easier to get medical licenses quickly (Zhai, 2020). When these barriers to telemedicine were removed, health systems quickly adopted telemedicine and expanded existing programs to meet the unanticipated demand for remote, synchronous patient care. The results showed that telemedicine visits for urgent and non-urgent ambulatory care have increased significantly, and patient satisfaction with telemedicine treatment has remained consistently high, both associated and unrelated to COVID-19. Telemedicine might be categorized according to the sort of communication used (Zhai, 2020).

According to the US CDC, a new coronavirus infection (COVID-19) has spread in China and now to every continent. It impends to overrun the healthcare system in the next few months, with each infected individual predicted to infect 2 or 3 other persons and the clinical spectrum of sickness yet unknown. COVID19 is transforming the way we provide health care. We are living in a time when learning and growth are at an all-time high. More medical practitioners are providing remote therapy than ever before, and more patients are seeking care in this manner as well (V'kovski et al., 2021). Despite the fact that many patients will return to the clinic once the epidemic has passed, telemedicine appointments are likely to remain popular. While telemedicine visits have frequently shown to be beneficial and convenient for both patients and physicians, many practices may have obstacles in launching and maintaining these services, and COVID-19 and the need to apply to distance measures may resurface in the future. Despite the fact that compensation appears to be aligned with patient needs, there are still barriers to access. State-level initiatives can help in bridging gaps in telemedicine availability. Some states have tried a number of ways to enhance internet access, including grant funding, income tax credits, and infrastructural collaboration. Unfortunately, these protocols are not in place in all jurisdictions, and these efforts will not solve all telemedicine issues particularly for older patients with cognitive or sensory impairments (Nittari et al., 2020). The absence of widespread access to communications infrastructure for the general public causes inequitable access to health treatments via telemedicine (Bashshur et al., 2020). Technical failure may be documented as much as possible by the supplier. Infrastructure and access hurdles, operational problems, regulatory barriers, communication barriers, and legislative barriers are among the issues and barriers that must be handled in a methodical manner. Access and communication during a healthcare engagement are critical moderators of outcomes for persons with disabilities. Significant, long-term improvements in technological, regulatory, and legislative infrastructure, as well as customized solutions to a specific patient and health system demands, are required to improve healthcare access and outcomes for persons with disabilities in the future. “Telehealth may become a critical requirement for the general public, health care professionals, and COVID-19 patients, especially while they are under quarantine, allowing patients to seek real-time counseling on their health issues through conversation with a health care practitioner.”. As a result, the focus of this study was to see how telehealth services fared in terms of sickness prevention, diagnosis, treatment, and control during the COVID-19 pandemic (Indria et al., 2020).

Conclusion

Doctors' first line of defense during the coronavirus pandemic was telemedicine, which preserved social distance and provided treatment for mild patients through phone conferences, allowing them to spend personal attention and limited supplies on the most serious cases. In most cases, latent structures would not be investigated, but they are in this case. It gives us a comprehensive view of how our healthcare systems are doing right now, as well as their strengths and potential. Simple and widely available technology, such as phone calls, has already facilitated the continuity of care throughout past pandemics; new channels of communication between patients and physicians are projected to improve communication fluency, ease, and efficiency. In clinical practice, patients inform about test results, reduce the time it takes to see a specialist doctor, and with a little more modern gadget assistance and monitor patients in their homes on daily basis. Diabetes, heart issues, skin flushes, the switch from hospital to primary care, and other illnesses can all benefit from telemedicine now that we know it is good and makes patient-doctor contact easier and more accessible.

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